



Litton Systems Inc. Site Springfield, Missouri Greene County

June 2024

Site Description

The former Litton Systems Inc. site is located at 4811 West Kearney Street in Springfield on approximately 70 acres of land just east of the Springfield-Branson National Airport. Litton Systems Inc. began manufacturing printed circuit boards in the 1960s and closed in 2007. The site buildings were demolished in 2008 and the site is now vacant except for concrete building slabs, groundwater monitoring and extraction wells, remnants of previous electrical resistivity heating remediation equipment and groundwater treatment facilities. The site is currently owned by Northrop Grumman Corporation Guidance and Electronics Company Inc., a subsidiary of Northrop Grumman Corporation, which acquired the site from Litton Systems Inc. in 2001. Northrop Grumman is actively investigating and cleaning up the site. The Missouri Department of Natural Resources (department) is overseeing this cleanup through its Superfund Cooperative Program, an alternative for contaminated sites that otherwise would be referred to the U.S. Environmental Protection Agency (EPA) for action.

Description of Contamination

During its operation, the facility generated waste materials containing metals, such as copper, and solvents, also called volatile organic compounds (VOC). The primary solvent used in Litton's operations was trichloroethylene (TCE). The contaminated manufacturing waste materials were placed in unlined lagoons, waste piles and pits on the Litton property until the early 1980s. After that time, waste materials were transported off site for proper disposal. The former waste management units did not fully contain the materials and contamination migrated to both soil and groundwater. To determine the extent of contamination, numerous investigations of surrounding soils, shallow groundwater, deep groundwater and vapor intrusion have been conducted on the former Litton property and surrounding area.

Underlying the Springfield area is an extensive network of voids, caverns and sinkholes in the shallow bedrock, and springs that surface at various points. These karst geological features provide preferential underground pathways for contamination to potentially travel farther than would otherwise occur in soil or non-karst saturated groundwater zones. In karst geology, groundwater contaminant plumes are difficult to fully characterize because they often do not follow a predictable pattern. Investigations by Northrop Grumman are ongoing.

Investigation and Cleanup Activities

The department has been actively involved with the Litton site since 1979. Early activities conducted by the department included several pre-remedial investigations and site assessments conducted between 1989 and 1993, which documented the presence of metals and VOC contamination in soil and groundwater, including TCE. Litton and Northrop Grumman have conducted additional assessments and site cleanup work with department oversight. Below are details about the various investigations and cleanup activities.

- Inspection and closure of waste management units: The department inspected Litton's operations in 1979 and observed plating waste overflowing from a lagoon into an on-site sinkhole. VOCs, including TCE, were detected in water samples from the lagoon. This raised concerns that plating waste could travel through the karst system on and near the property, possibly contaminating groundwater and adversely affecting nearby springs and private wells. In 1980, the Missouri Clean Water Commission ordered Litton to connect to the Springfield Municipal Sewer System and cease discharges to the waste management units on the Litton

property. To comply with this order, the waste management units were closed by 1982, and Litton was connected to Springfield's sewer system.

- Soil Investigations: In 1985, the department completed a Superfund Preliminary Assessment, followed by a Site Inspection in 1988 that included soil sampling and analysis. Sample results showed the presence of copper, chromium, lead, arsenic, silver, nickel and VOCs above both background and health-based screening levels in soil on the Litton site. From 1994 to 2001, Litton conducted Phase I (site-wide summary) and Phase II (soils) investigations. These investigations were performed to determine the extent of soil contamination associated with the former waste management units. From 2001 to 2006, Northrop Grumman continued remedial investigations to determine the extent of contamination in both soil and groundwater. This series of remedial investigations documented contamination from VOCs (mainly TCE) and metals in soils on the Litton property.
- Soil Cleanup: From 1994 to 2001, the department oversaw Litton's investigations and cleanup activities. Copper-contaminated soils on the Litton property were consolidated and capped in place or removed and properly disposed of at an approved off-site facility.

Since 2001, contaminated soil clean-up methods have consisted of soil removal and disposal at approved off-site locations, heating the soil and capturing the TCE vapors, and mixing materials into the soil to help naturally occurring microbes destroy the TCE. Soil treatment is now complete at all seven areas of concern: SB-19 Area, Former Percolation Terrace, A/B Lagoon, Original Acid Pits, New Acid Pits, Former Sanitary Lagoon and Former Building Subfloor. Northrop Grumman submitted a soil cleanup completion report for the last area (the Former Building Subfloor) to the department in September 2022. The department approved this report in November 2022. In July 2023, Northrop Grumman submitted a Summary of Soil Remediation Completion Activities for all Areas of Concern at the site along with a subsequent response to the department's comments on this report in February 2024. The department approved this report and the associated response to comments in June 2024.

- Groundwater Investigations: Results from Litton's Phase I and Phase II investigations showed the shallow Springfield Plateau Aquifer was impacted by metals and VOCs from the site at levels above their respective Maximum Contaminant Levels (MCL). MCLs are standards set by EPA to protect public health by limiting the levels of contaminants in public drinking water supplies. The deeper Ozark Aquifer was also determined to be impacted by VOCs at levels above the MCL. Between 2001 and 2006, Northrop Grumman continued remedial investigations to determine the extent of soil and groundwater contamination at and near the former Litton property.

Groundwater movement in the shallow aquifer at the site is generally to the north-northeast. Area-wide investigations, including subsurface dye traces, indicate a connection between the contaminated wells and springs, and groundwater near the site. Additional information on the extent of groundwater contamination is being collected through ongoing groundwater monitoring, which employs a network of on-property monitoring wells and off-property private domestic-use water wells.

Groundwater Cleanup: In 1994, treatment of the shallow Springfield Plateau Aquifer was implemented to control migration of the contaminated shallow groundwater. The present-day system consists of three extraction wells (MW-129, MW-132, and MW-133) on the former Litton property and two extraction wells (MW-135 and MW-136) located west of the former Litton property across North General Aviation Avenue on airport property. Monitoring at the groundwater plume's perimeter has shown a steady decline in TCE levels in most of the wells. This is a result of Northrop Grumman's continuing soil and groundwater cleanup efforts. In 2021, Northrop Grumman also conducted a pilot study at the Original Acid Pits to assess the effectiveness of extracting both groundwater and vapor from existing wells via multi-phase extraction. Currently, existing wells associated with potential reinjection of treated groundwater are undergoing additional evaluation and the existing groundwater treatment system is being enhanced. In addition to extraction and treatment of contaminated groundwater from the Springfield Plateau aquifer, Northrop Grumman operates two groundwater extraction wells (MW-05 and MW-07) completed within the deeper regional Ozark aquifer.

- EPA and Department Investigations 1980-1988: In 1980 and 1981, EPA sampling of lagoon water and monitoring wells documented VOC contamination in groundwater at the site. Between 1980 and 1988, the department's subsequent investigations documented VOCs and copper in area springs, and TCE in two private wells. One of the wells contained TCE, but the level at that time was below the MCL for TCE of 5 parts per billion (ppb). Sampling results showed TCE in wells and both TCE and copper in springs and wells located east of the former Litton site.

- Department Site Reassessment 2003-2006: In 2003, the department initiated a site reassessment investigation to evaluate the threat that past contaminant releases at the site could pose to human and environmental health. This investigation included collecting and analyzing water, sediment and air samples from springs and a commercial cave (Fantastic Caverns) located north and east of the site. Water samples were also collected from private and public drinking water wells located within 4 miles of the site, primarily to the north and east. The department's 2006 site reassessment report documented that VOCs and metals, mainly TCE and copper, were found up to 4 miles north and east of the former Litton site. The department did not identify any other significant sites contributing to contamination.

Of the more than 70 private drinking water wells sampled in 2004-2005 during the site reassessment, 13 showed detectable levels of TCE. Only one well showed TCE above the MCL of 5 ppb and the concentrations were only slightly above the MCL. Water from this well continues to be treated with a carbon filtration system that Northrop Grumman installed in November 2004. Of the six public wells that were sampled, only one had detections of TCE. The Country Squire Village well, located 1.5 miles east of the Litton site, has had intermittent detections of TCE, all below the MCL. This well is now monitored quarterly. A total of 10 springs were sampled during the site reassessment, with TCE detections in four of those springs.

- Private Well Sampling 2018-Present: In late 2018 and early 2019, in response to renewed public concerns, the department conducted extensive private drinking water well sampling within a focus area around the site. This focus area was established within 4.5 miles of the Litton site, based on subsurface dye trace study data documenting groundwater flow. The department collected samples from a total of 191 private drinking water wells, as well as 16 homes that receive water from shared wells. Four additional private wells contained TCE above the MCL. Northrop Grumman installed and maintains treatment systems at these additional locations, with the exception of one system that has been removed at the owner's request. Northrop Grumman regularly collects samples from these wells, as well as post-treatment samples from the home treatment systems to ensure the systems are effectively removing TCE.

In March 2019, Northrop Grumman took over the domestic well sampling program, with the department providing oversight. To date, Northrop Grumman and the department have collectively sampled over 400 domestic-use wells near the former Litton facility. In addition, Northrop Grumman collects samples from all wells that have been found to contain TCE below the MCL, as well as from a subset of wells that did not contain TCE during prior sampling. During the most recent sampling event in the third and fourth quarter of 2023, Northrop Grumman collected samples at 51 private well locations. Forty-eight additional wells were scheduled for sampling during this period; however, these wells were not sampled due to lack of response from homeowners, homeowners declining to be sampled, house renovations underway or lack of contact information for new homeowners. Of the 51 wells sampled, TCE was not detected above the reporting limit of 1 ppb in 37 wells. Samples from seven of the 51 wells contained detectable concentrations of TCE and/or TCE breakdown products; however, all detections for these seven wells were below the respective TCE MCL of 5 ppb for drinking water use. Seven wells exhibited a TCE concentration above the MCL; however, home water treatment systems are installed at those residences. Groundwater entering and exiting the treatment systems was tested and neither TCE nor TCE breakdown products were reported above the MCL in the samples collected following treatment. The cumulative number of sampled domestic wells continues to increase as previously unknown wells are discovered and property owners granted permission to sample those wells. Northrop Grumman routinely provides the sampling results to homeowners and a report to the department.

- Vapor Intrusion Investigation: Vapor intrusion is a process in which vapors from volatile chemicals (a class of chemicals that evaporate easily and form a vapor in the air) in soil or groundwater migrate indoors where they can accumulate in indoor air to levels of potential health concern.

Northrop Grumman continues to assess the potential for vapor intrusion that includes soil vapor and shallow groundwater sampling on and off the former Litton property. Between April 2017 and December 2020, Northrop Grumman collected soil gas samples both on and off the former Litton property, including the general area of the airport to the west, residential property to the south and public rights-of-way (i.e., public roadways) extending several miles to the north, east, south, northeast and southeast.

To date, concentrations of contaminants identified in soil vapor ranged from non-detectable to very low in all locations off the former Litton property, except for the public rights-of-way immediately south of the site on Kearney Boulevard, and in the eastern parking lot areas near the former airport terminal building. Sampling locations in immediate proximity to the former airport terminal ranged from non-detectable to very low. Sampling results collected since April 2017 do not suggest a current impact to indoor air quality within occupied commercial or residential structures, including several airport hangers. Northrop Grumman's March

2019 vapor intrusion investigation at residential property south of the site included soil gas, sub-slab and indoor air sampling at two private properties. VOCs were not detected in the indoor air or sub-slab samples. Low levels of VOCs were detected in soil gas; however, the concentrations were below health-based action levels. Northrop Grumman will continue periodic vapor intrusion assessment sampling on an as needed basis at the airport property and local residences.

- Fantastic Caverns Investigation: The department first conducted air sampling in Fantastic Caverns in April 2004, during the Litton site reassessment investigation. TCE was detected in a sample collected at the second bridge feature inside the cavern. Further air sampling was conducted in February and again in November 2005. TCE was not detected in cave air in February; however, it was detected in November 2005 under the second bridge. An evaluation of those data concluded that the TCE concentrations were not at levels expected to cause adverse human health effects, based on available TCE toxicity values and exposure conditions at that time.

In 2016, the department conducted a third round of air sampling in Fantastic Caverns as part of a statewide investigation of air quality in toured caves near known sources of VOC contamination. Between April 2016 and November 2017, the department conducted a total of 14 air sampling events in Fantastic Caverns. The recommended health-based level of concern for air in a commercial workplace is 8.8 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). TCE concentrations from several of the sampling locations in the cave were above the health-based level of concern. Among samples collected in the toured portions of the cave, the maximum TCE concentration was 88 $\mu\text{g}/\text{m}^3$, measured at the Sink Hole feature July 13, 2017. These sampling results were all from stationary 8-hour, time-integrated air samples.

Stationary samples collected over an 8-hour timeframe at specific locations in the cave are not representative of actual exposure patterns for either the public or tour guide staff, since cave tours only spend brief periods of time at each cave feature. In 2018, to better estimate TCE exposure for tour guides, Ozark Underground Lab (OUL), consultant for Fantastic Caverns, collected personal air monitoring samples during 12 sampling events. Periodic exceedances of the health-based level of concern for TCE were recorded during five of those events.

In 2018 and 2019, OUL implemented a series of measures to reduce TCE concentrations in air within the tourist portions of the cave. These measures have included drilling boreholes into the lower unoccupied portions of the cave system and using fan-powered ventilation on select boreholes to expel TCE vapors. Data that Fantastic Caverns continues to present to the department in a series of reports indicates the borehole ventilation efforts have been successful in reducing TCE concentrations in air within the tourist portions of the cave to below levels of human health concern. To maintain control of TCE vapors, Fantastic Caverns plans to continue the borehole ventilation and sampling efforts.

Agency Actions Taken

In October 1991, the department proposed placing the Litton site on the Missouri Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites. Litton appealed and agreed to clean up the site, which would preclude the need for the listing. In July 1993, Litton signed a Consent Agreement with the department to conduct on-site investigation and cleanup. Following EPA's 1993 Site Inspection Prioritization and subsequent Hazard Ranking System computation, EPA deferred proposing the Litton Systems site for placement on the National Priorities List (EPA's list of the most serious sites in the nation identified for long-term cleanup), because the department had already entered into a cleanup agreement with Litton.

In March 2010, the department entered into a Consent Decree with Northrop Grumman to perform remedial actions on the former Litton property and beyond the former Litton property boundaries where contamination has migrated. This Consent Decree replaced the 1993 Consent Agreement with Litton.

On March 14, 2019, the department hosted an informational public meeting in Springfield regarding the Litton site. Information presented at the meeting included a brief site history, a summary of area environmental cleanup and sampling efforts, an overview of future work plans, activities on property belonging to Fantastic Caverns and a discussion of TCE, the primary site contaminant. Presentations from that meeting are located online at dnr.mo.gov/waste-recycling/sites-regulated-facilities/superfund/interest/litton-systems-inc.

On Nov. 7, 2019, the department hosted another public meeting and open house in Springfield. Staff from the department, the Missouri Department of Health and Senior Services (DHSS) and Northrop Grumman provided updates on activities at the Litton site. Information on the investigations at the Electro-Pac site also was provided.

Presentations from the meetings can be found online at dnr.mo.gov/waste-recycling/sites-regulated-facilities/superfund/interest/litton-systems-inc.

Future Actions

Northrop Grumman continues to collect investigation and monitoring information in support of developing a proposed final plan for contaminated groundwater cleanup. Various options will be evaluated and presented to the department for review. The process of evaluating and selecting a final remedy for contaminated groundwater will include involvement from the community, including an opportunity for the public to review and comment on any proposed final remedy for groundwater cleanup. The department anticipates hosting public meetings to provide progress updates on the investigations and cleanup.

Activities scheduled for 2024 and beyond include:

- Continued extraction and treatment of groundwater from the Springfield Plateau and Ozark aquifers and discharge of treated groundwater to the Springfield sanitary sewer system. Potential reinjection of treated groundwater into the Ozark aquifer is being considered in lieu of discharge to the sanitary sewer system. Well testing will be performed to determine if reinjection of treated groundwater is a viable option.
- Regularly scheduled operation, maintenance and monitoring for the Springfield Plateau and Ozark aquifer treatment systems.
- Regularly scheduled maintenance and sampling of private well treatment systems.
- Regularly scheduled sampling and analysis of groundwater from private wells and site-specific monitoring wells.
- Continued evaluation of the Springfield Plateau aquifer contamination through the installation of additional exploratory borings and groundwater grab sampling.
- Collection and analysis of samples from several springs located in proximity to the site.
- Removal of sediment and collection/analysis of groundwater samples from the lower portion of the MWO-09 borehole located on the Springfield Branson National Airport property.
- Evaluation of local caves and springs within the area of interest to assess the potential for human and environmental receptor exposure to site-related contaminants.
- Routine submission of reports for ongoing activities.
- Two wells where TCE has consistently been present above the MCL will be provided with city water in the near future. Once this occurs, the affected wells will be plugged and home treatment systems will be removed at those locations. One other well where TCE has consistently been present above the MCL is scheduled to be plugged in the near future and a replacement well will be installed and tested at that location. Providing city water and well replacement at the three affected locations was approved by the department with comments on May 6, 2024.

In response to community concern, DHSS sent out a questionnaire in early 2020 to gather input on community concerns; information gathered will be shared with the community as part of DHSS's public health consultation, which is being drafted to evaluate potential community exposures to TCE in private well water. Release of the public health consultation is anticipated in the next few months.

For More Information

For additional information regarding the site, contact the department's Superfund Section at 573-751-4187. The department updates the Litton webpage and this fact sheet as new developments emerge and this information can be found online at dnr.mo.gov/waste-recycling/sites-regulated-facilities/superfund/interest/litton-systems-inc.

Residents living inside the focus area, depicted on the sampling map on the following page, and those who get their drinking water from private wells, may request free drinking water sampling for TCE and other VOCs by calling 573-751-4187. For health-related questions about TCE, contact DHSS at 573-751-6102.

Site Location Aerial Map



